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LAMONT GEOLOGICAL OBSERVATORY
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⑨ Semi-annual Technical Summary Report. 1 Jan - 30 Jun 63,
January 1 - June 30, 1963

⑪ 30 Jun 63,

⑫ ARPA Order No. 218-61
Project Code No. 8100
Contractor - Columbia University
Contract Date: 1 April 1961
Contract Amount: \$154,180.00
⑬ Contract Number: Nonr 266 (82)
Contract Expiration Date: 31 March 1964
Project Scientist: Kenneth Hunkins
Elmwood 9-2900

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Studies in marine geophysics and underwater sound
from drifting ice stations.

I. Magnetism Experiment on Fletcher's Ice Island (T-3)

In the fall of 1962 a magnetism experiment was made on T-3. The Naval Ordnance Laboratory supported this project with supplemental funds to this contract. James Cottone and Arthur Jokela did the field work. Dr. James Heirtzler has written a technical report on the results of the work, (Technical Report No. 7, CU-7-63 Geology, Contract Nonr 266 (82), in Press). The abstract to this report is included here.

NA

"Simultaneous Geomagnetic Measurements on an Ice Island Surface and 1000 ft. Below", by J. R. Heirtzler

Abstract: "For a few weeks in the fall of 1963 the total geomagnetic field intensity was measured simultaneously on an ice island surface and approximately 1000 feet below. The magnetic gradient as indicated by the difference between the two readings varied as the station passed over geologic bodies. A statistical analysis of the time variations during two time intervals revealed an attenuation and phase shift of the lower beach reading with respect to the surface head reading. The analysis was made between 70 and 400 seconds period. There are indications of an anomalous attenuation at the lower period end of this band although the experiment was not such that accurate determinations could be made."

II. Summer Program on T-3

Dr. Kenneth Hunkins, Mr. Ralph Shaver and Mr. John Berry arrived at T-3 to carry out the summer program. The program will include measurements of long- and short-period ice vibrations, measurements of underwater ambient noise, precision depth recording, seismic profiling, gravity and magnetic measurements, bottom sampling, ocean water sampling for age determinations, measurements of thermal fluctuations at depth in the ocean, and navigation.

III. Data Reduction

Work continued on reducing data gathered at T-3. The drift track of T-3 was plotted up to 1 June 1963. The position of T-3 on January 1, 1963, was $81^{\circ}10'N$, $161^{\circ}30'W$. The water depth at this time was 3435M. On June 1, 1963, T-3 was at $82^{\circ}24.8'N$, $159^{\circ}23'W$ and the water depth was 3789M. During the period covered in this report, T-3 drifted over a portion of the Canada Abyssal Plain. Work continued on analyzing the data obtained while T-3 was in the Chukchi Cap area.

IV. Seismic Refraction Studies This Fall

Equipment was assembled in preparation for the marine seismic program this fall. Dr. Hunkins will work with the group from the University of Wisconsin. Plans include completing several long refraction profiles north of Barrow, Alaska. Shooting will be done from U.S. icebreakers.

V. Ocean-bottom and Ice Surface Seismic Noise Measurements Made on ARLIS II

A portion of the abstract of a paper on ocean bottom noise by D.D. Prentiss and J.I. Ewing is included here. This paper will be published in Bull. Seis. Soc. Am., Vol 53, No. 4, pp 765-781, July 1963.

"The Seismic Motion of the Deep Ocean Floor"

Portion of Abstract: "Measurements in samples of up to one hour in duration were made in the Arctic Ocean at three stations. Amplitudes of about 1 millimicron at 1 CPS were observed ---. The measurements were made at intervals during a 16-day period, and a good correlation was found in both time and amplitude between seismic noise on the ice surface and on the ocean bottom in the band from 1 to 10 CPS. ---P waves from an Alaskan shock and a possible PKP phase from a New Zealand shock were recorded. The P wave signal to noise ratio recorded in the Arctic for the Alaskan shock was 250:1. After correction is made for the difference in epicentral distance, the signal to noise ratio at Ogdensburg, New Jersey, for this shock is only 20:1. Ogdensburg is quieter than an average station."

VI. Shallow-Water Sound Propagation in the Arctic Ocean

"Shallow-Water Propagation in the Arctic", by K. Hunkins and H. Kutschale, published in J. Acoust. Soc. Am., Vol 35, No. 4, pp 542-551, April 1963.

Abstract: "Dispersion characteristics of underwater sound on the Arctic continental shelf north of Alaska were investigated at ranges between 2 and 250 Km and for frequencies between 3 and 250 CPS. Explosive charges were used as sources, and geophones were used as detectors. Observations were interpreted in terms of normal mode theory and good agreement between theory and experiment was found for both phase and group velocity. Portions of the first and second modes were recognized at all ranges, and, at short ranges, "leaking modes", associated with the ice layer, were also noted. For long ranges, the water wave amplitude varied as the -1.85 power of range."

VII. Additional ARLIS II Results

At the AGU meeting last April, H. Kutschale presented "Seismic Profiler Measurements in the Siberia Basin: Arctic Ocean". This was a preliminary report. Additional work has been done on the profiler, PDR, and magnetics data. The results will appear in a published paper. H. Kutschale will present a paper, "A Long Refraction Profile on the Arctic Continental Shelf" at the IUGG meeting this August. Co-authors of this paper are E. Thiel*, D. D'Andrea**, K. Hunkins, and N. Ostenso***. This paper should be ready to submit for publication shortly.

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** University of Minnesota

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ARPA Order No. 218-61
Project Code No. 8100

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